AN INTERPERSONAL ANALYSIS OF PSYCHOSOCIAL STRESS AND SLEEP

by

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STATEMENT OF DISSERTATION APPROVAL

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ABSTRACT

Psychosocial stress is strongly related to sleep disturbance; however, little is known about the specific interpersonal aspects of stress that are associated with sleep quality and presleep arousal (PSA). Structured interviews from 76 participants (53% female) about a recent stressful event were objectively coded for interpersonal patterns using Structural Analysis of Social Behavior. Sleep quality and PSA were assessed with the Pittsburgh Sleep Quality Index (PSQI) and the presleep Arousal Scale. Stressor narratives characterized by higher trust in others were associated with lower overall PSQI scores, less daytime dysfunction, and shorter reported sleep onset latencies. Stressor narratives characterized by hostile distancing (i.e., isolation and withdrawal) were associated with higher cognitive PSA. Findings highlight the importance of perceived interpersonal safety versus threat in the context of stressful events and sleep quality.

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INTRODUCTION

Sleep is often considered an isolated, individual process, but researchers and clinicians have begun to recognize that the psychosocial environment plays a large role in sleep regulation and is an important consideration for treatment of sleep disorders such as insomnia. Most research on how the sleep of one person is related to others in their psychosocial environment has focused on the impact of the romantic or bed partner (for review, see Rogojanski, Carney, & Monson, *in press* and Troxel, Robles, Hall & Buysse, 2007); however, it is becoming more apparent that humans need not be in the physical presence of another person for sleep to be affected by interpersonal relations. That is, perceptions or cognitive representations of affiliative or threatening interpersonal encounters may also mitigate sleep quality regardless of whether another person is present. The current study examines stress-related relational responses, such as affiliation (i.e., friendliness versus hostility) and interdependence (i.e., autonomy versus enmeshment), to determine the association between perceived threat and safety and presleep arousal and overall sleep quality.

Background: Interpersonal Stress and Sleep

Many studies have found that the perception of interpersonal stress is strongly associated with poor sleep quality and the onset of insomnia (e.g., Bastien, Vallieres & Morin, 2004; Cartwright & Wood, 1991; Healey et al., 1981; Linton, 2004; Nakata et al.,

2001; Nakata et al., 2004). The type of stress reported in the literature has varied. Death of a loved one or loss of close relationships (Healey et al., 1981; Kurina et al., 2011), work-related demands and interpersonal conflict at work (Linton, 2004; Nakata, et al., 2001), and family conflict at home (Bernert, Merrill, Braithwaite, Van Orden, & Joiner, 2007) have all been broadly implicated in poor sleep quality.

Morin, Rodrigue, and Ivers (2003) found that the frequency of daily or minor stress is similar in insomniacs and good sleepers, suggesting that greater exposure to stress is not sufficient to explain links between interpersonal conflicts or losses, and sleep. The same authors also found that presleep arousal mediated the association between daily stressors and sleep quality (Morin et al., 2003). Their findings suggest that individual differences in the perception and interpretation of stressful events and presleep arousal are key to understanding stress-sleep associations.

An Evolutionary View of Safety and Sleep

From an evolutionary perspective, sleep may be especially vulnerable to social processes. During sleep, most sensory processing is suspended, which significantly limits how one might respond to potential threat or danger. If there is perceived threat, sleep would be maladaptive, and under those conditions would be elusive and fragmented (that is, the felt need for safety can trump sleep). In order to protect against danger, humans learned to find “safe” places to “turn off” sensory processes and sleep (Worthman & Melby, 2002). Safe places for early humans, who were especially vulnerable as ground-dwelling bipeds, involved affiliation with close-knit social groups (Worthman & Melby, 2002). Subsequently, our ancestors gauged their safety via their social environment,

thereby becoming sensitive to others' social behaviors (Dahl & Lewin, 2002). Likely as a result of evolutionary adaptation, perceived safety is still considered important for healthy sleep patterns (Dahl & El-Sheikh, 2007). Since humans need one another to achieve a sufficient sense of safety to allow for sleep, a disruption to the social network (or, by extension, threats that come from the social network itself) creates a gap in the safety net necessary for sleep.

Social Relations and Sleep

Studies of the psychosocial environment and how it is related to sleep have primarily revolved around examining specific attachment styles. Therefore, a brief review of attachment styles is warranted. Bowlby (1969) emphasized the need for safety in the social environment and posited that humans have an innate need to attach to others. Children develop an attachment style that is based on their caregiver's treatment of and response to them (i.e., based on the internalization of interactions with important others that he described as internal working models). The adopted attachment style is often categorized in research as "secure" or "insecure" with three subtype of insecure attachment (anxious, avoidant and ambivalent), and is considered fairly stable over the lifespan (Ainsworth, 1985; Karen, 1994). Bartholomew and Horowitz (1991) developed ways of classifying adult attachment in the same categories and a large literature followed showing that attachment types are powerfully associated with physical health (McWilliams & Bailey, 2010), mental health indices, and stress responses (reviewed in Simpson & Rholes, 2012).

Relational Styles and Sleep

Indeed, specific attachment styles have also been linked to sleep quality. In general, insecure attachments tend to be associated with worse sleep, though findings vary by the specific type of insecure style. For example, attachment anxiety (characterized as fear of abandonment; Bowlby 1979) has been found to be associated with poor sleep in the context of major life stress (marital rupture; Troxel, Cyranowski, Hall, Frank & Buysse, 2007) and minor life stress (temporary separation from a partner; Diamond, Hicks, & Otter-Henderson, 2008). Further, Carmichael and Reis (2005) found that attachment anxiety predicted poor sleep quality even after controlling for generalized anxiety disorder and depression.

Whereas anxious attachment tends to be associated with poor sleep, the limited research on disengagement and avoidant types of attachment have conflicting findings. An avoidant attachment style is defined as a tendency to suppress needs for closeness and value autonomy (Fraley & Shaver, 2000). When comparing anxious to avoidant attachment styles, Troxel and Germain (2010) found that attachment anxiety was associated with worse objective sleep quality, whereas attachment avoidance was associated with more restful sleep (i.e., increase in delta waves) in military veterans with PTSD symptoms. Other researchers have found that attachment avoidance was associated with poor subjective sleep quality (Carmichael & Reis, 2005; Sharfe & Eldredge, 2001); however, after controlling for depression in one study, the association was no longer significant (Carmichael & Reis, 2005). It may be that context (i.e., response to threat or stress) plays an important role in differing findings in avoidant attachment styles. Hicks and Diamond (2011) found that both avoidant and anxious attachment were associated

with increased sleep disturbances following a conflict with a partner. Although disturbances were greater for anxiously attached individuals, it is important to note that sleep was also disturbed for avoidant individuals. This highlights that avoidant styles (and the presumed behaviors that are associated with it: withdrawal, disengagement) may be associated with poor sleep specifically in the context of interpersonal stress.

In contrast to insecure attachment styles, limited research examining adult relational styles and sleep quality generally supports the idea that good sleep quality in adults involves interpersonal friendliness, relationship satisfaction, and, by extension, implicit trust in others. Marital satisfaction, a reasonable proxy for affiliation and trust, and therefore safety and security, is associated with better sleep quality (Troxel, Buysse, Hall, & Matthews, 2009). In addition, reports of secure attachment to others, even when not in a romantic relationship, are associated with good sleep quality in college students (Sharfe & Eldridge, 2001).

Interpersonal Behaviors, Stress, and Sleep

This brief review suggests that interpersonal stress is related to sleep. In some instances the relationship between certain types of stress (e.g., divorce) and sleep has been influenced by attachment styles. The current study extends upon previous findings on categorically defined relational styles and sleep quality by examining specific interpersonal behaviors in the context of stress (e.g., relationship conflict, academic struggles, financial concerns) to determine how these are associated with sleep quality and presleep arousal. In other words, we are interested in examining how people respond to stress and if relationally defining the stress response provides additional clarity to the

association between stress and sleep. Do specific interpersonal responses, such as hostility or friendliness, relate to sleep quality and arousal? It has been demonstrated that stress is associated with presleep arousal (e.g., Morin et al., 2003), but to our knowledge specific stress-related behaviors that are associated with rumination and cognitive arousal (key characteristics of poor sleepers; Harvey, 2000) have not yet been identified. Nuanced behaviors exist that are likely directly associated with safety and threat responses to stress. Exploring these can enhance our understanding of previous research on psychosocial stress, relational patterns, and sleep.

This report focuses on interpersonal response styles to stress and descriptions of the responses at the individual level rather than as types. The method was to describe narratives of top-ranked stress using Structural analysis of Social Behavior (SASB, Benjamin, 1979, 1996a/2003). The SASB model has been used in much research (see Benjamin, 1996b; Benjamin, Rothweiler & Critchfield, 2006). It is has also been utilized in the realm of health psychology to increase understanding of psychosocial risk factors for cardiovascular disease and other physical illnesses (Gallo & Smith, 1999; Smith, Traupman, Uchino, & Berg, 2010). It was useful to apply interpersonal theory (Sullivan, 1953), as represented by SASB and to interpret using Benjamin's version of "natural biology" (Benjamin, draft) to provide more detail about the interpersonal nature of stress and how that relates to sleep. Benjamin notes that safety and threat responses are directly tied to the autonomic nervous system. This is relevant because the autonomic nervous system has been implicated in studies of stress and sleep. For example, the night following an acute laboratory stressor (speech task), participants showed blunted parasympathetic activity during sleep (Hall et al., 2004), which suggests that stress is

linked to reduced safety. Given that attachment style is implicated in sleep, it is likely that specific interpersonal (e.g, anger, withdrawal) responses to stress (threat) play a role in sleep quality. The reasoning, according to the natural biology of Interpersonal Reconstructive Therapy (IRT in Benjamin, 2003/2006; related to natural biology in Benjamin, draft), is that anger is a mobilizing affect based in the sympathetic nervous system (i.e., threat system) that serves the interpersonal purpose of achieving control or distance. If mobilized for control, the threat system affect of anger is accompanied by action associated with fight. If mobilized for flight, the threat system affect is fear and the behavior is flight. Whether fight or flight, anger and fear are mobilizing affects and they interfere with sleep. The opposite of fight or flight (anger/fear) is resting and relaxing, and is based in the safety system (parasympathetic). Safety system affects are characterized mostly by friendliness and relaxing is associated with sleep. Hence, hostility (fight/flight) is associated with wakefulness and its opposite, friendliness, is associated with having a secure base and is conducive to sleep.

The Current Study

With SASB it is possible to describe specific interpersonal behaviors and then link them to apprehensions (perception of threat and safety) in a way that is consistent with a "natural biology" evolutionary perspective. In this study, SASB was used to code interpersonal responses to a top-ranked stressor in a semistructured interview format and evaluate how they are associated with sleep quality. The particular focus was whether interpersonal responses to stress are reflected in threat system activation (i.e., higher presleep arousal or poor sleep quality), which in turn is associated with sleep disruption.

Use of SASB in this study provided a framework that is consistent with previous research on attachment and sleep, and the evolutionary stance that perceived threat is associated with worse sleep and perceived safety is associated with better sleep. It also provided the opportunity to enhance our understanding of stress and sleep by examining interpersonal stress in finer detail. SASB identifies interpersonal behavior based on dimensions of affiliation and autonomy. The horizontal axis (Figure 1) maps affiliation ranging from hostility (attack/recoil) to intense friendliness (active love/reactive love). The vertical axis (Figure 1) maps interdependence, ranging from enmeshment (control/submit) to independence (Emancipate/separate). Dimensions of affiliation and autonomy are observed according to whether the behavior is focused on others (i.e., transitive), in response to others (i.e., intransitive), or appears as self-treatment. The focus distinction is demonstrated by considering the difference between transitive protection of others versus intransitive trust in others. Both behaviors are friendly and moderately enmeshed, but the focus is different, and could have very different sleep-related outcomes. As parents can attest, engaging in protection of others (e.g., children) could easily interfere with sleep whereas trusting that others are there to protect would likely enhance sleep.

Therefore, in the current study, specific behaviors described in the stressor narratives were coded according to the SASB, which utilizes focus plus the dimensional scores of affiliation and autonomy to specify behavior. Positive affiliation scores represent more affiliation; negative scores represent hostility. Positive autonomy score represent more autonomy and negative scores, more enmeshment. For example, trust in others is focused on self and is in the region of friendly submission (i.e., affiliative

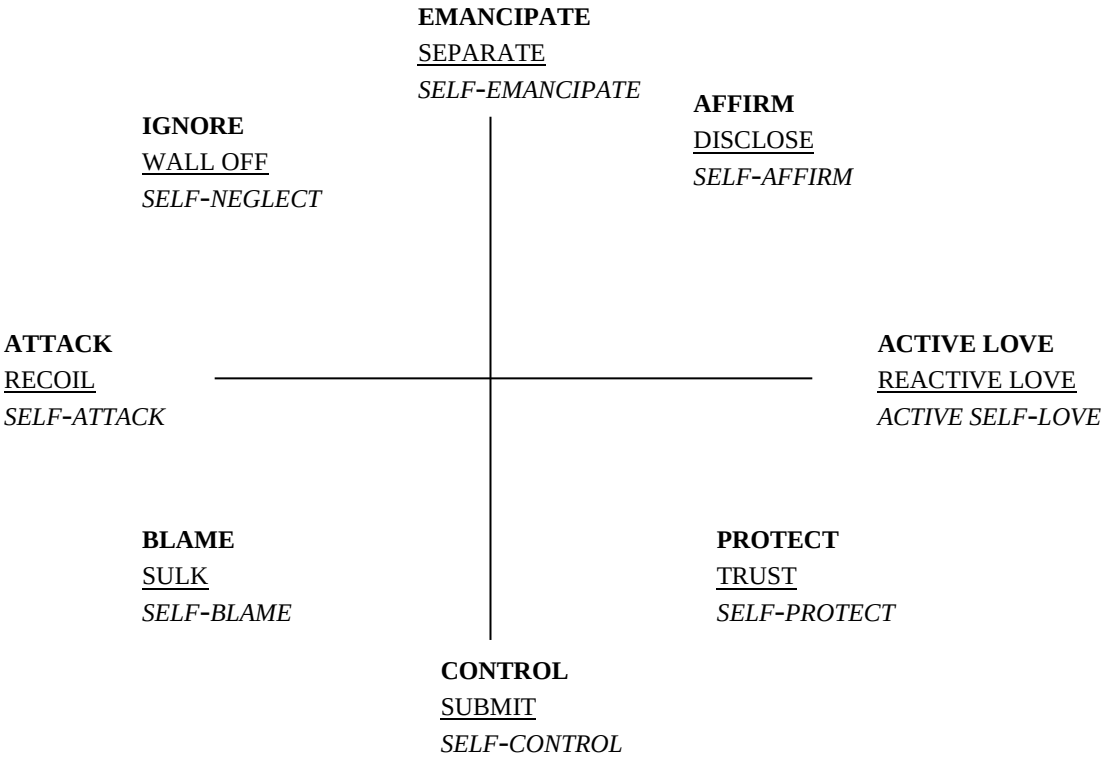

Figure 1. The SASB Simplified Cluster Model. Labels in **BOLD PRINT** describe actions directed at another person (not utilized in this study). The UNDERLINED labels describe reactions to another person. Labels in *ITALICS* describe Introject, (behavior directed towards the self). From *Interpersonal Diagnosis and Treatment of Personality Disorders* (2nd ed., p. 55), by L. S. Benjamin, 1996a, New York: Guilford Press. Copyright 1996 by Guilford Press. Reprinted with permission by The Guilford Press.

and more enmeshed; Figure 1). The affiliation and autonomy scores and the individual behaviors that comprise them (e.g., trust), were used to predict ratings on two commonly-used measures of sleep and presleep arousal, the Pittsburgh Sleep Quality Index (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) and the Presleep Arousal Scale (Nicassio, Mendlowtiz, Fussell, & Petras, 1985).

Given that secure attachment is thought to be characterized by more friendliness and moderate enmeshment, and that it has been linked to better sleep quality (e.g., Sharfe & Eldredge, 2001), it was expected that stressor narratives characterized by greater affiliation would be associated with lower scores on the PSQI and less presleep arousal. In contrast, behaviors that are hostile (i.e., negative affiliation scores) would show the inverse association. Furthermore, it was expected that autonomy (i.e., the dimension ranging from enmeshed to separate) would moderate the association between affiliation and sleep. More specifically, descriptions of trust in others (moderate friendliness, moderate submission, a form of enmeshment; e.g., Figure 1) in stressor narratives would be associated with lower scores on the PSQI and less presleep arousal, whereas descriptions of hostile separateness from others would be associated with higher scores on the sleep measures indicating sleep disruption. It was expected that behaviors associated with self-trust and self-reliance (i.e., moderate and friendly self-directed behavior) would be associated with better sleep quality because these types of introject patterns are characteristic of secure attachment as evidenced by studies specifically examining attachment and SASB assessed introject in adults (Gallo, Smith, & Ruiz, 2003; Pincus, Dickinson, Schut, Castonguay, & Bedics, 1999). On the other hand, self-directed criticism and self-neglect (hostility that varies according to vertical axis) would

be associated with poor sleep as these are characteristic of insecure attachment and would correspond to threat and not safety.

METHOD

Study Design and Participants

The current examination of interpersonal stress and sleep was part of a larger study examining gender and other individual differences in stress regulation. Ninety-eight undergraduates (48 women and 51 men; mean age = 22.97 years, *SD* = 5.8) completed the protocol and received course credit. Participants were 80% Caucasian, 5% Asian, and 4% African American, and were recruited through the University of Utah Psychology Department participant pool. The University of Utah Internal Review Board approved the study protocol. Participants were informed about the general nature of the study and were given procedural information (e.g., that they would be asked to discuss life events). The current sample is based on a subset of individuals (*N* = 76) who had valid video and audio recording of their interviews (described below).

Interview Procedure

Following informed consent, participants were asked to rank order a list of 21 stressors commonly experienced by college students (derived from the Inventory of College Students' Recent Life Experiences; Kohn, Lafreniere, & Gurevich, 1990). The top-ranked stressor was discussed using the Social Competence Interview (SCI; Ewart, Jorgensen, Suchday, Chen, & Matthews, 2002). The SCI is an 8-minute semistructured interview designed to assess socio-emotional responses to a real-life event. The interview

is structured such that the first four to six minutes are devoted to describing memory of the stressful event in detail, including specific people, places, how the participant responded (verbally, behaviorally), and how he/she felt. The reliability and validity of the SCI as a laboratory stress task and an assessment tool for understanding characteristic stress responses is well-established (Ewart et al., 2002). The protocol employed in this study elicited significant increase in subjective stress and physiological arousal (Williams, Rau, Cribbet, & Gunn, 2009), confirming the stressful nature of the events described in the interviews. Stressor interviews were video-recorded and were later SASB coded, as described below.

Sleep Measures

Prior to the interviews, participants completed the *Presleep Arousal Scale* (PSAS; Nicassio et al., 1985) in relation to the previous night and completed it again online in the evening following the interview. The PSAS contains 16 items that assess cognitive (e.g., racing thoughts, worries) and somatic (e.g., heart racing, muscle tension) states of arousal at bedtime. Scores for each subscale range from 8 – 40, with higher scores indicating more arousal. This measure has been demonstrated to be reliable over time (Nicassio et al, 1985) and demonstrated good internal reliability in this study (alpha = .86). The current study utilized the average of the two nighttime ratings to better approximate each individual's general tendencies to experience presleep arousal.

Participants also completed the *Pittsburgh Sleep Quality Index* (PSQI; Buysse et al., 1989), which assesses sleep quality disturbances during the previous month. The scale is comprised of 19 items, which are used to derive seven component scores: Sleep

Quality, Sleep Latency, Sleep Duration, Habitual Sleep Efficiency, Sleep Disturbances, Sleep Medication, and Daytime Dysfunction. Component scores are summed to produce a global PSQI score, ranging from 0 – 21, with higher scores indicating poorer sleep quality. Global sleep scores were used as the measure of sleep quality in this study. Because only a small percentage of participants reported medication use (14%), this component was not examined. This instrument has been shown to be a valid assessment of sleep quality as it reliably discriminates between good and poor sleepers and has good internal and test-retest reliability (Buysse et al., 1989; Morin & Espie, 2003). It demonstrated good internal reliability in this study (alpha = .80).

Measuring Interpersonal Safety and Threat

As illustrated in Figure 1, SASB is a circumplex-based model with affiliation represented on the horizontal axis (i.e., from attack/recoil to active/reactive love) and autonomy on the vertical axis (i.e., from emancipate/separate to control/submit). Affiliation captures the degree of warmth or hostility, whereas autonomy reflects degree of enmeshment (control or submission) versus differentiation (autonomy-granting or separation). The SASB model has three surfaces on which to rate affiliation and autonomy. The first two surfaces are defined by their attentional focus in relation to another person (i.e., behavior can be "to, for, or about" others, or the self). Focus on Other (bolded text in Figure 1) represents transitive actions towards others, such as **CONTROL** and **BLAME.** Focus on Self (underlined text in Figure 1) represents intransitive actions in relation to others, such as SUBMIT and SULK. Introject (italicized text in Figure 1) describes a person's own actions toward the self such as *SELF-CONTROL* and *SELF-*

BLAME, which in this study was in relation to the stressor discussed. The interview task included prompts to discuss the stressor that included "How did you feel when that happened?" and "What was going through your mind?" that most often yielded relational descriptions characterized by Focus on Self or Introject behaviors. Focus on Other behavior was less commonly elicited. Therefore, analyses were based on participants' behavior that was focused on self in response to the stressor as well as self-directed behavior (Introject) in response to the stressor, which was also commonly mentioned.[1]

Coding procedure

Coders were two advanced clinical psychology graduate students and one postdoctoral fellow who all completed a graduate level course in SASB coding and had additional coding experience in a therapy practicum employing the SASB model or in empirical studies using SASB. Following procedures in the SASB coding manual (Benjamin & Cushing, 2000), coders coded each "thought unit" for appropriate reference, focus, and type of behavior based on degree of affiliation and autonomy described in relation to the stressor. Thought units for coding are defined as a complete sentence expressed by the participant containing, or implicating, a noun, verb, and object. The referent clarifies to whom the behavior was directed. In this study, only descriptions of the participant's own behavior were analyzed because the study hypotheses about sleep emphasize a participant's response to stressful input. Each unit was assigned a position

[1] Introject is best obtained in a psychotherapy format or through Intrex measures that specifically assess Introject. The reason is that it requires one to discuss inner feelings and thoughts directed toward the self. In this sample, we did obtain Introject codes, which is likely due to types of questioning in the semistructured interview (e.g., How were you feeling?) which elicited specific thoughts and feelings related to the stressor

on the SASB model based on focus (Other, Self, or Introject), degree of autonomy, and degree of affiliation. For example, in the following statement, "I told my roommate how I was feeling," the participant is referencing her own behavior in relation to the roommate, the focus of that behavior is on the self (i.e., the focus is "about" the participant) and the behavior described is moderately friendly and autonomous. It conforms to the upper right quadrant of the SASB model in the position labeled DISCLOSE. After the videos were coded, specific codes for each thought unit were processed through SASB coding software (Benjamin, 2000) which yields proportions of each position on the SASB model and profile dimensions reflecting total degree of affiliation and autonomy (details presented below) for each focus. Narratives sometimes included reference to more than one other person. In these cases, behaviors described in relation to the person most relevant to the stressor were preserved and used in the analyses.

Coding reliability

Twenty-one percent of videos (N = 16, including > 1200 separate codes) were randomly selected to examine interrater reliability and yielded an average weighted kappa of .70 (range from .56 to .81) at the unit-by-unit level of analysis. These values are in acceptable for analyses conducted in this study and are similar to previous studies using SASB content coding (Critchfield, Levenick, & Benjamin, 2012; Critchfield, 2002; Humes & Humphrey, 1994).[2] Reliability at the aggregate level was similarly strong, yielding an average Pearson's r of .84 (range from.60 to .94) for SASB profiles.

[2] A subset of eight cases had consensus codes entered into the database due to observed low reliability (N = 6), or because they were used for training purposes (N = 2). Vague behavioral descriptions in some respondent narratives were the primary cause of

SASB variables used for analyses

Primary hypothesis testing was conducted using SASB dimensional scores of Affiliation (AF) and Autonomy (AU). When significant effects were found at this aggregate level, specific behavioral clusters contributing to the dimension were also explored. As defined in the SASB manual (Benjamin & Cushing, 2000), AF is a weighted summary score of the amount of affiliation in the participant's interpersonal behavior. Maximum affiliation is given the highest weight (e.g., REACTIVE LOVE), clusters without affiliation receive a weight of zero (e.g., SUBMIT), and clusters containing hostility receive negative weighting (e.g., RECOIL). Similarly, AU is a weighted summary score of autonomy focused on self or directed at the self in the participant's narrative. Maximum autonomy taking is given the highest weight (e.g., SEPARATE) and clusters reflecting enmeshment are given negative weights (e.g., SUBMIT) whereas clusters without autonomy are not weighted (e.g., REACTIVE LOVE). Weights are given in Benjamin & Cushing (2000) and implemented by the SASB scoring software. Both AF and AU are calculated separately for each focus. Analyses for specific clusters of behavior (i.e., specific positions on the SASB model) were conducted using proportions of codes assigned to each cluster. Proportions for Focus on Self were calculated by dividing each cluster (e.g.,TRUST) by the total number of interpersonal codes given (i.e., Focus on Other, Focus on Self). Proportions for Introject were calculated by dividing each cluster (e.g., SELF-PROTECT) by the total number of Introject codes given for the individual's narrative.

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disagreement when it occurred. These narratives are included in the reported kappa ranges and average kappa score.

Analytic Approach

Insomnia rates are higher for women than men (Buysse, Germain, & Mole, 2005), therefore, gender differences in sleep variables were assessed first with t-tests. Separate regression analyses for cognitive and somatic presleep arousal (subscales measured by the PSAS) and global sleep quality (as measured by the PSQI) were conducted for Focus on Self and Introject to examine the associations among SASB dimensions and sleep as well as the hypothesized interactions. In each analysis, the first set of predictors was AF and AU (i.e., the affiliation and autonomy dimensional scores) followed in the next step by the interaction term. All predictors were centered to minimize multicollinearity. Gender and the interaction term were included in regression models to determine the extent to which gender moderates the association between SASB dimensions and sleep. In the event that global sleep quality was significantly related to a SASB dimension, PSQI component scores were further explored using correlation analyses. Similarly, when AF or AU was significantly associated with sleep, interpersonal clusters that contribute to that dimension were explored using correlation analyses. Significant associations between SASB dimensions and sleep were plotted and assessed for influential observations (i.e., outliers). In the two cases in which there was one influential observation, analyses were re-run, were no longer significant, and are not reported.

RESULTS

Gender Analyses

T-tests revealed no significant gender difference in global sleep quality, $t(74) = -1.28$ or cognitive presleep arousal, $t(74) = -.20$, ps $> .10$. The t-test for gender and somatic presleep arousal subscale revealed that scores for women ($M = 10$) were higher than scores for men ($M = 8.94$), $t(71) = -2.44$, $p < .05$. T-tests were also conducted for SASB dimensional scores for affiliation and autonomy for Focus on Self and Introject. Results indicated that gender was not related to mean affiliation and autonomy scores for Focus on Self or Introject, ps $> .05$. Separate regression models for sleep quality, cognitive, and somatic presleep arousal that included first order effects (AF and AU), second order effects (AF, AU, and AF x AU interaction term) and the gender x AF and gender x AU interaction terms were also examined. The two-way interactions for gender were not significant which suggests that gender does not moderate associations between SASB dimension scores and sleep quality or SASB dimension scores and cognitive or somatic presleep arousal. Given these initial findings, gender was removed as a moderator variable in the reported analyses.

Correlations and Descriptive Statistics

Frequencies of individual top-ranked stressor topics are provided in Figure 2. The overall mean for global sleep quality (i.e., PSQI total score) was 6.04 ($SD = 3.5$), for cognitive presleep arousal was 14.09 ($SD = 6.2$), and for somatic presleep arousal was 9.5

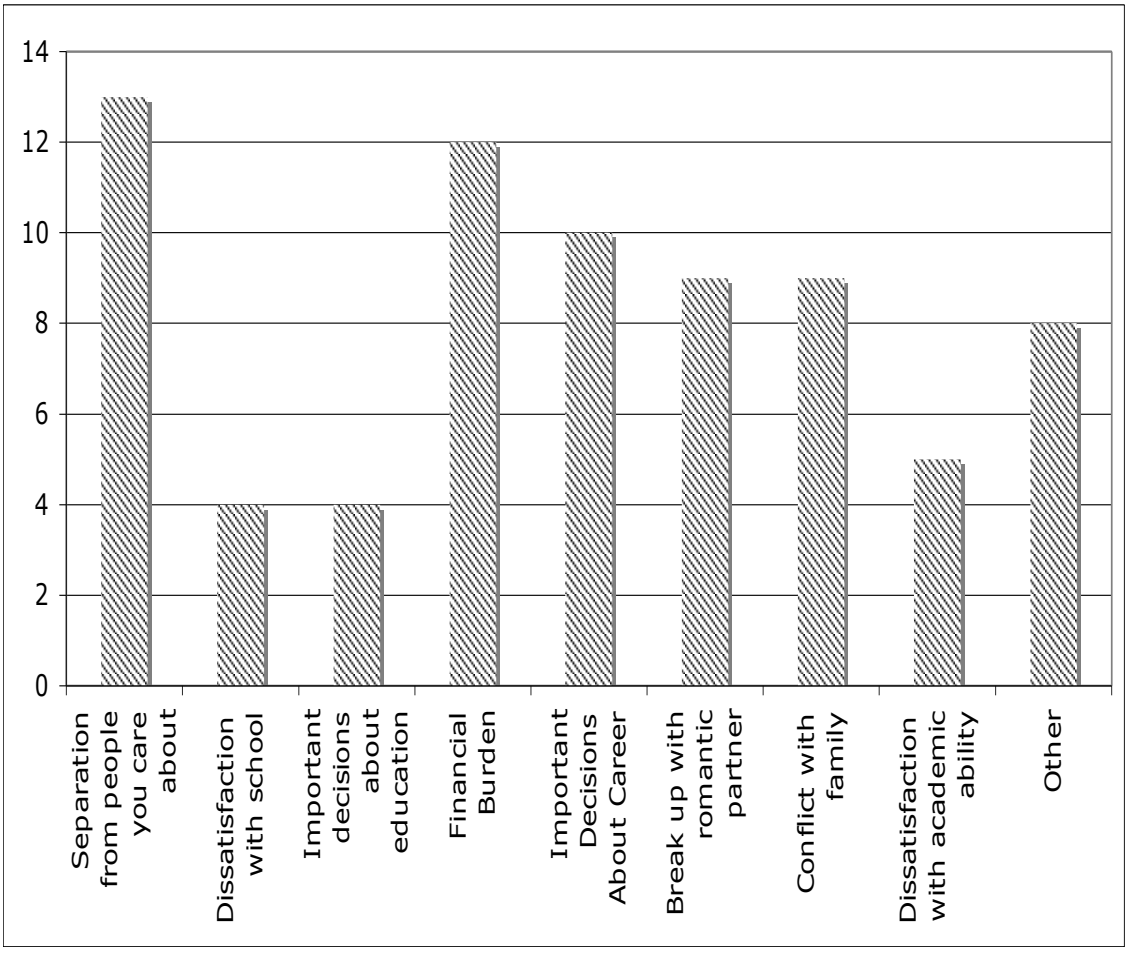

Figure 2. Frequency of Top-Ranked Discussion Topics.

(*SD* = 1.99). Global PSQI scores were positively correlated with both cognitive (*r* = .53) and somatic (*r* = .41) presleep arousal subscales. Means and standard deviations of SASB variables are presented in Tables 1 and 2.

The analyses were organized separately by Focus on Self and Introject. Analyses were conducted only for cases having at least one observation with a particular focus. In other words, participants had to have at least one behavior (i.e., cluster) described as Focus on Self or Introject to be included in analyses. The number of codes per participant for Focus on Self ranged from 1 to 16 (*M* = 4.5). The number of codes for Introject ranged from 1 to 32 (*M* = 7.67). There were more observations of narratives containing Introjective behavior (*N* = 76) than Focus on Self behavior (*N* = 64), therefore the *N* for their respective analyses differs[2].

SASB Dimensions, Clusters, and Sleep

Focus on self

The overall model for associations between Focus on Self SASB dimension scores and cognitive presleep arousal was significant, F (2, 63) = 3.6, $p < .05$. AF (ß = -.32, $p < .05$) but not AU (ß = -.02, $p > .05$) was independently associated with cognitive presleep arousal. The overall model for associations between SASB AF and AU dimensional scores and somatic presleep arousal was not significant F (2, 63) = .93, $p > .10$ and neither AF (ß = -.08) nor AU (ß = -.14) was independently associated with somatic presleep arousal (*p*s > .10). Turning to global sleep quality (PSQI total scores), the overall model for associations with Focus on Self SASB dimension scores was not significant, F (2, 63) = 2.54, $p > .05$. However, AF (ß = -.28, $p < .05$) and not AU (ß =

.03, $p > .05$) was independently associated with global sleep quality. The AF x AU interaction term was not significant for cognitive or somatic presleep arousal or global sleep quality.

Table 1. Means and Standard Deviations of Affiliation Autonomy, and Clusters for Focus on Self ($N = 64$).

SASB dimension or cluster	AF	AU	SEPARATE	DISCLOSE	REACTIVE LOVE	TRUST	SUBMIT	SULK	RECOIL	WALL OFF
M	-10.08	-16.65	.08	.06	.01	.12	.08	.31	.00	.08
SD	31.42	36.63	.20	.16	.04	.27	.17	.30	.01	.14

Note. AF = affiliation dimension; AU = autonomy dimension; *M* = Mean, *SD* = Standard Deviation; Cluster values represent the mean percentage for that cluster relative to all clusters for Focus on Other and Focus on Self.

Table 2. Means and Standard Deviations of Affiliation, Autonomy, and Clusters for Introject ($N = 76$).

SASB dimension/cluster	AF	AU	*SELF-EMANCIPATE*	*SELF-AFFIRM*	*ACTIVE SELF-LOVE*	*SELF-PROTECT*	*SELF-CONTROL*	*SELF-BLAME*	*SELF-ATTACK*	*SELF-NEGLECT*
M	-9.16	-47.55	.02	.08	.00	.13	.38	.29	.00	.10
SD	30.18	35.26	.08	.16	.003	.20	.29	.33	.00	.18

Note. AF = affiliation dimension; AU = autonomy dimension; *M* = Mean, *SD* = Standard Deviation; Cluster values represent the mean percentage for that cluster relative to all clusters for Introject.

Introject/Self-treatment

Regression models examining associations between Introject SASB dimension scores and sleep variables were not significant, *p*s > .05.

Cluster and subscale level analyses

Since affiliative Focus on Self was associated with sleep quality and cognitive presleep arousal, PSQI component scores and clusters that contribute to this AF dimension were further explored. SASB clusters Reactive Love and Recoil were excluded from cluster-level analyses because occurrences of these codes were rare (5% and 2% of all cases, respectively). Thus, amounts of SASB-defined DISCLOSE; TRUST; SULK; WALL OFF (see Figure 1) were explored. With respect to overall the Affiliation score and specific components of the PSQI, Affiliative Focus on Self was associated with longer sleep duration $r(64) = -.298$, $p < .05$, in that more affiliation in response to others was associated with more hours of sleep each night. Correlations among individual clusters, PSQI global sleep quality, PSQI component scores, and cognitive presleep arousal are presented in Table 3.

As seen in Table 3, participants who described more TRUST of others during their stressor discussion task had lower global PSQI scores, fewer reported minutes to sleep onset, and less reported daytime dysfunction. Similarly, the opposite of trusting and relying on others, WALL OFF, was associated with higher cognitive presleep arousal. The SASB cluster, SULK was not associated with global PSQI scores, component scores, or

cognitive presleep arousal. Thus, trust in others was associated with less problematic sleep whereas hostile separation was associated with more cognitive presleep arousal.

Table 3. Correlations Among Selected Focus on Self SASB Clusters, PSQI Global and Component scores, and Cognitive and Somatic Presleep Arousal. (N = 64)

	SASB clusters			
	DISCLOSE	TRUST	SULK	WALL-OFF
PSQI				
Global score	-.13	-.31*	.18	.17
Subjective Sleep Quality	-.13	-.14	.03	.17
Sleep Latency	-.06	-.27*	.08	.17
Sleep Duration	-.13	-.21	.22	.12
Habitual Sleep Efficiency	-.07	.01	.08	-.17
Sleep Disturbance	-.15	-.06	.10	.07
Daytime Dysfunction	-.05	-.27*	.13	.08
PSAS				
Cognitive presleep arousal	-.24	-.19	.11	.37**
Somatic presleep arousal	-.20	-.04	.07	-.01

Note. Higher scores on the PSQI, including component scores, indicate poorer sleep quality; higher scores onthe cognitive and somatic presleep arousal subscales indicate greatercognitive, and somatic presleep arousal, respectively. Higher scores on SASB clusters indicate a higher percentage of that cluster present in respondent narratives. *$p < .05$. **$p < .01$

DISCUSSION

In this study, stressor narratives characterized by affiliative interpersonal responses were associated with lower cognitive arousal and less problematic overall sleep quality. Narratives describing less affiliation and/or greater reactive hostility were associated with greater cognitive presleep arousal and poorer overall sleep quality. Specifically, more affiliation in response to others was associated with lower PSQI scores and obtaining more sleep per night. Trust in others, in particular, was associated with less problematic sleep (i.e., lower scores on the PSQI, less daytime dysfunction, and fewer reported minutes to sleep onset), whereas the interpersonal opposite (i.e., 180 degrees around the SASB model) —walling off—was associated with greater cognitive presleep arousal. In sum, these findings suggest that trust in others in the context of stress, is associated with less problematic sleep, whereas hostile distancing is associated with greater cognitive pre sleep arousal.

This is the first study, to our knowledge, to use interpersonal coding to examine stress responses and subjective sleep quality. Results are consistent with previous research in which measures of affiliation (e.g., self-reported warmth, marital happiness) have been found to be associated with better sleep quality (e.g., Scharfe & Eldridge, 2001; Troxel at al., 2009). The association between interpersonal patterns in response to stress and sleep suggests that one of the underlying mechanisms between stress and sleep may be the interpersonal response, including trust in others, as it was particularly relevant

for better sleep quality. In our study, a specific example of trust and relying was an individual asking for his wife's help in making decisions about remodeling their home when he felt stuck. This is relevant in light how Bowlby emphasized having a secure base, "…well-adapted personalities show a smoothly working balance of, on the one hand initiative and self-reliance, and, on the other, a capacity to both seek help and make use of help when occasion demands" (Bowlby, 1979, p. 128). This type of flexibility facilitates safety and may protect against sleep difficulties even when experiencing stress. This finding also provides additional specificity to the observation that presence of social support is beneficial (Troxel, Buysse, Monk, Begley, & Hall, 2010). Specifically, an interpersonal position of intransitive friendly submission, or trust, according to the SASB model is directly related to less problematic sleep.

Interestingly, the opposite of trust, or "walling off," was associated with nighttime cognitive arousal, which is related to the development of insomnia (Perlis, Smith, & Pigeon, 2005; Roth, et al., 2007), but it was not associated with other indices of poor sleep quality (e.g., onset to sleep latency, fragmentation). Though the correlations were in the expected direction (Table 3), they were not significant. Given that this was a sample of healthy young adults, it is possible that individuals who are prone to nighttime cognitive arousal have not yet developed symptoms of a greater sleep disturbance. Nevertheless, this finding is consistent with research demonstrating that loneliness (e.g., feeling isolated, feeling left out) is associated with greater sleep fragmentation (restlessness during sleep; Cacioppo et al, 2002; Kurina et al., 2011). This finding may also shed light on the previous studies of avoidant attachment as walling-off could correspond to behavior exhibited by a fearful-avoidant attachment style as opposed to a

dismissive avoidant style. This finding also highlights the notion that secure attachment and trust are antidotes to anxiety, as was suggested by Bowlby. It is possible that individuals who isolate themselves in response to stress, presumably out of fear, are more likely to ruminate and have increased vigilance and arousal. Benjamin's description of "natural biology" notes that the threat and safety systems are "wired" in opposition, so when one is activated the other is not (Benjamin, draft). Trust and security, then, may be an antidote to anxiety and feeling stressed or threatened. Individuals who responded to threat with hostile distance may not have the "relief" that is obtained when there is trust in others. Walling off is the opposite of trust according to SASB, so perhaps it underscores the importance of trust and security to sound sleep.

The overall focus of the present study was to examine psychosocial stress with an interpersonal lens by utilizing an objective method of coding interpersonal behavior that is based on attachment and learning theories. Results suggest that responses to stress associated with affiliation and trust during stress is associated with less problematic sleep quality, whereas withdrawal and isolation during stress is associated with poor sleep quality. It is important to note that poor sleep could also influence stress responses because of its influence on affect and behavior. This has been demonstrated by studying how sleep deprivation affects cognitive processing and emotional regulation (e.g., Kahn-Green, Lipizzi, Conrad, Kamimori & Killgore, 2006). To that end, recent findings indicate that the relationship between poor sleep (i.e., not deprived) and interpersonal stress is bidirectional (e.g., Akerstedt et al., 2012; Garde, Albertsen, Persson, Hansen, & Rugulies, 2011; Hasler & Troxel, 2010) and perhaps more of a cyclical process (Garde et al., 2011). That is, disruptions in the psychosocial environment can affect sleep via

ruminative arousal. Poor sleep, in turn, can influence regulatory processes and relations with others. Thus, disruptions in a safety system that is established by attachment to others may be the starting point of a negative feedback loop in which perceptions of diminished safety bring about specific interpersonal behaviors that are associated with safety and threat.

In this study, withdrawal from others in the context of stress was associated with increased cognitive arousal, which suggests that one interpersonally-related step in the cycle is ruminative arousal. On the other hand, trust in others in the context of stress was associated with less cognitive arousal and lower scores on a measure of poor sleep, which suggest that knowing when to ask for support or rely on others is important.

Limitations, Future Directions, and Conclusions

Results from this study are unique in using interpersonal theory to characterize participants' narratives about stressful events. This approach helps draw stronger links between the psychosocial environment and sleep quality in adults. It is important to note, however, that the sample was comprised of healthy, college undergraduates. It would be expected that relational patterns associated with threat (e.g., hostility, withdrawal) would be even more pronounced in a clinical sleep population. The current study was also limited by utilizing only subjective measures of sleep quality. Although insomnia diagnosis and treatment relies almost solely upon subjective report, objective measures of sleep, such as polysomnography, would draw stronger links between stress-related interpersonal behaviors and the parasympathetic and sympathetic activity during sleep. This could help provide specific targets for intervention if, for example, hostile

withdrawal is associated with increased autonomic arousal at night. In addition to examining the interpersonal content of nighttime cognitive arousal, future research should examine interpersonal patterns in clinical sleep samples to make stronger inferences about the association between threatening interpersonal patterns and sleep disorders.

Analysis of self-treatment (i.e., Introject) in the context of a stressful event did not yield any significant findings related to the sleep variables. Although we obtained many Introject codes, we utilized observer ratings of Introject, whereas self-ratings may have provided information about the individual self-treatment of which the observer may not be aware (Benjamin, 1996c). SASB Intrex questionnaires (Benjamin, 2000) are powerfully linked to psychopathology, and would therefore be expected to be related to sleep problems. For example, Erickson and Pincus (2005) used the SASB-based Intrex questionnaire to demonstrate that anxiety disorders were associated with more self-directed hostility (e.g., self-blame, self-neglect, self-attack). This study was also limited in its ability test dyadic interpersonal patterns due to the chosen interview style (i.e., greater focus on response of participant). Future research should expand the interactive context by ensuring that the interview elicits clear descriptions of interpersonal behaviors from both the narrator and the other person described in the stressor. SASB coding interactions between two people or using SASB questionnaires to assess one's behavior and their perception of behavior of important others are two methods that would provide richer interpersonal context. This will be essential for continuing to examine interpersonal patterns in the psychosocial environment and how they relate to sleep.

Limitations notwithstanding, this study provided preliminary support for an interpersonal model of sleep in which sleep quality can be understood by examining one's behavioral reaction to stressors in the psychosocial environment. It is the first study to employ objective coding of stress-related interpersonal narratives in association with sleep; this approach may help to identify specific behaviors that can be targeted for intervention in treatment of insomnia (e.g., withdrawal from others). For example, in subsets of patients whose sleep problems do not remit using standard treatment approaches, reports of general stress could be explored further for more detail about maximally-arousing relational patterns and how perceived safety might be increased.

In conclusion, this interpersonal examination of psychosocial stress and how it relates to sleep quality and presleep arousal extends previous research that has implicated the psychosocial environment in sleep in a way that is consistent with evolutionary theory. The extent to which specific types of interpersonal behavior were associated with cognitive presleep arousal and sleep quality varied according to affiliation versus hostility. Results provide preliminary support for using an interpersonal framework to further understand the relationship between the psychosocial environment and sleep. Use of an interpersonal framework, in turn, has implications for understanding the mechanisms underlying psychosocial stress and sleep and for helping improve the efficacy of insomnia treatment by targeting specific interpersonal behaviors that would promote feelings of safety and security.

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